

**STATEMENT REGARDING SEQUENCE LISTING**

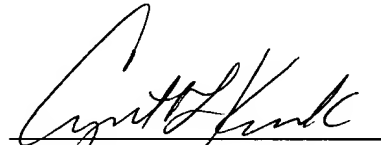
In response to Notice to Comply With Requirements for Patent Applications Containing Sequence Disclosures dated July 30, 2001, Applicants hereby submit a paper copy of the sequence listing containing pages 1-29 to be included in the specification part of the disclosure as required by 37 C.F.R. § 1.821(c). Pursuant to 37 C.F.R. § 1.821(e) and (f), the content of the paper copy of the sequence listing for this application and the computer readable form of the application serial no. 09/438,460 is identical. Therefore, in lieu of filing a duplicate computer readable form in this application, please use the computer readable form of application serial no. 09/438,460. It is understood that the Patent and Trademark Office will make the necessary change in application number and filing date for the instant application.

**REMARKS**

The specification has been amended to include sequence identifier numbers where there are references made to these sequences. In compliance with 37 C.F.R. § 121, a "Version With Markings to Show Changes Made," is submitted herewith as Appendix I. No new matter has been added to the application.

Respectfully submitted,

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**Version With Markings to Show Changes Made****In the Specification****The paragraph starting at page 3, line 28 has been amended as follows:**

From the disclosures discussed above, as summarised in WO97/12912, it has been concluded that essential to the membrane translocating properties of the homeodomain peptides, is the presence of a tryptophan residue as the sixth residue from the amino terminus. Conforming to these requirements has been a penetratin variant of the formula (KWKK)<sub>4</sub> (SEQ ID No. 64) which has been described as having translocating ability (Maruta H et al. Cytoskeletal tumour suppressors that block oncogenic RAS signalling. Presented at Anti-Cancer Proteins and Drugs: Structure, Function and Design; 6 - 9 November 1998, New York Academy of Sciences. Poster/abstract No. 11) and Plank C et, al. (Human Gene Therapy, (1998) 10, 319-332) that discloses a number of branched membrane translocating peptides such as (KWKK)<sub>2</sub>KGGC (SEQ ID No. 65), wherein each KWKK (SEQ ID No. 66) is joined to the following lysine residue.

**The paragraph starting at page 5, line 14 has been amended as follows:**

Thus, in a preferred embodiment the carrier moiety includes the peptide sequence RRMKWKK (SEQ ID No. 2) or a variant thereof and may preferably be defined as a membrane translocation peptide carrier moiety comprising up to 15 amino acid residues and at least the peptide of formula;

RRMKWKK (SEQ ID No. 2) (I)

1            7

or variants thereof. The preferred embodiments discussed in relation to the first aspect apply in their entirety to the peptide of formula (I). In one embodiment, the amino acid residues added to the peptide of formula (I) are those corresponding residues in penetratin, or variants thereof.

**The paragraph starting at page 7, line 22 has been amended as follows:**

Within the definition of formula (I) it has been demonstrated that it is preferable for amino acid variation, preferably of type (a) or (b), to occur independently at any of positions 1, 2, 3, 5 or 6. More preferably, amino acid variation occurs at positions 3 or 7, especially 3.

Homologous substitution has been found to be preferable at positions 1 and 2, whereas positions 3, 4, 5 and 6 have surprisingly been observed to accept non-homologous substitution. As mentioned above more than one homologous or non-homologous substitution may occur simultaneously, for example at positions 2 and 3, 4 and 5 or 5 and 6. Further variation may occur by virtue of reversing the sequence of a number of amino acid residues within a sequence. For example in the peptide sequence RRMKWKK (SEQ ID No. 2), the lysine and tryptophan residues may be reversed to give a peptide RRMWKKK (SEQ ID No. 3). This modification may additionally occur in combination with a homologous or non-homologous substitution, for example, the sequence RROKWKK (SEQ ID No. 4) giving rise to RROWKKK (SEQ ID No. 5).

**The paragraph starting at page 8, line 6 has been amended as follows:**

The carrier moiety may include further amino acid residues at the amino terminal end, more preferably by the addition of from 1 to 3 amino acid residues. Thus, a further embodiment of this aspect of the present invention relates to a peptide selected from RRMKWKK (SEQ ID No. 2), NRRMKWKK (SEQ ID No. 6) QNRRMKWKK (SEQ ID No. 7) and FQNRRMKWKK (SEQ ID No. 8).

**The paragraph starting at page 8, line 11 has been amended as follows:**

In the most preferred embodiment of the first aspect of the invention, the truncated form of penetratin is of formula (I) described above or more preferably to a 7 amino acid peptide selected from KRMKWKK (SEQ ID No. 9), RKMKWKK (SEQ ID No. 10), RREKWKK (SEQ ID No. 11), RRQKWKK (SEQ ID No. 12), RROKWKK (SEQ ID No. 4), RRMKQKK (SEQ ID No. 13), RRMKWFK (SEQ ID No. 14), RORKWKK (SEQ ID No. 15), RRMWKKK (SEQ ID No. 16), RROWKKK (SEQ ID No. 5), RRMKKWK (SEQ ID No. 17) and RROKKWK (SEQ ID No. 18), most preferably, the peptide carrier moiety is RRMKWKK (SEQ ID No. 2).

**The paragraph starting at page 11, line 16 has been amended as follows:**

The peptide carrier moieties of the present invention may comprise amino acids in the L or D form, i.e. one or more residues, preferably all the residues may be in the L or D form. Within this embodiment, the peptide may be in the *retro* form for example, the peptide KKWKORR (SEQ ID No. 36).

**The paragraph starting at page 18, line 16 has been amended as follows:**

Within the carrier moieties defined as penetratin or derivatives thereof, a further modification that is beneficial in the context of the present invention is conversion of the free carboxyl group of the carboxy terminal amino acid residue, to an carboxamide group. By way of example, when the carrier moiety is of formula I (RRMKWKK) (SEQ ID No. 2) the carboxy terminal lysine residue may have its carboxyl group converted into an carboxamide group. This modification is believed to enhance the stability of the carrier moiety and hence the delivery system as a whole. Thus, the C-terminal amino acid residue may be in the form -C(O)-NRR', wherein R and R' are each independently selected from hydrogen, C1-6 alkyl, C1-6 alkylene or C1-6 alkynyl (collectively referred to "alk"), aryl such as benzyl or alkaryl, each optionally substituted by heteroatoms such as O, S or N. Preferably at least one of R or R' is hydrogen, most preferably, they are both hydrogen.

**The paragraph starting at page 18, line 29 has been amended as follows:**

Thus, its most preferred embodiment, the present invention relates to a carrier moiety RRMKWKK (SEQ ID No. 2) with an optionally amidated terminal lysine residue, directly worked to a cargo moiety selected from p21<sup>WAF</sup> derived peptides, p16 derived peptides or the drugs, roscovitine, taxol or a podophyllotoxin.

**The Table starting at page 20 has been amended as follows:**

| # | Drug moiety        | Linker moiety                        | Carrier moiety   |
|---|--------------------|--------------------------------------|--|
|   | paclitaxel         | 2'-succinimidopropionoyl-C $\beta$ A | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2)                              |
|   | podophyllotoxin    | 4-succinimidopropionoyl-C $\beta$ A  | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2)                              |
|   | podophyllotoxin    | 4-succinimidopropionoyl-C $\beta$ A  | (D-R)(D-R)(D-M)(D-K)(D-W)(D-K)(D-K-NH <sub>2</sub> )<br>(SEQ ID No. 2) |
|   | epipodophyllotoxin | 4'-succinimidopropionoyl-C $\beta$ A | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2)                              |
|   | podophyllotoxin    | 4-acetyl-C $\beta$ A                 | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2)                              |

|            |                                    |   |   |
|------------|------------------------------------|---|---|
|            | 4'-demethyl<br>epipodophyllotoxin  | 4-acetyl-C $\beta$ A                                      | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2) |
|            | podophyllotoxin                    | 4-succinimidopropionoyl-<br>GC $\beta$ A                  | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2) |
| C-<br>term | podophyllotoxin                    | 4-succinimidopropionoyl-C                                 | RRMKWKK<br>(SEQ ID No. 2)                 |
| N-<br>term | podophyllotoxin                    | 4-succinimidopropionoyl-C                                 |   |
| N-<br>term | epipodophyllotoxin                 | 4'-succinimidopropionoyl-C                                | RRMKWKK<br>(SEQ ID No. 2)                 |
| C-<br>term | camptothecin                       | 10-O-succinimidopropionoyl-<br>C                          |   |
| N-<br>term | epipodophyllotoxin                 | 4'-succinimidopropionoyl-C                                | RRMKWKK<br>(SEQ ID No. 2)                 |
| C-<br>term | paclitaxel                         | 2'-(succinimido)propionoyl-C                              |   |
|            | 4'-methoxy-<br>epipodophyllotoxin  | 4-(4''-aminoanilino)<br>succinimidopropionoyl-C $\beta$ A | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2) |
|            | 4'-demethyl-<br>epipodophyllotoxin | 4-(4''-aminoanilino)<br>succinimidopropionoyl-C $\beta$ A | RRMKWKK-NH <sub>2</sub><br>(SEQ ID No. 2) |

Table 1, on page 26 has been amended as follows:

TABLE 1

| N° | <i>Peptide</i>   |
|----|--|
| 1  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 19) |
| 2  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-NH <sub>2</sub><br>(SEQ ID No. 37)     |
| 3  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-NH <sub>2</sub><br>(SEQ ID No. 38)         |
| 4  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-NH <sub>2</sub><br>(SEQ ID No. 39)             |
| 5  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-NH <sub>2</sub><br>(SEQ ID No. 40)                 |

|    |  |
|----|--|
| 6  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-NH <sub>2</sub><br>(SEQ ID No. 41)                 |
| 7  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-NH <sub>2</sub><br>(SEQ ID No. 42)                     |
| 8  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-NH <sub>2</sub><br>(SEQ ID No. 43)                         |
| 9  | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-NH <sub>2</sub><br>(SEQ ID No. 44)                             |
| 10 | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-NH <sub>2</sub><br>(SEQ ID No. 45)                                     |
| 11 | Biotinyl- $\beta$ Ala-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 46) |
| 12 | Biotinyl- $\beta$ Ala-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 47)     |
| 13 | Biotinyl- $\beta$ Ala-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 48)         |
| 14 | Biotinyl- $\beta$ Ala-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 49)             |
| 15 | Biotinyl- $\beta$ Ala-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 50)                 |
| 16 | Biotinyl- $\beta$ Ala-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 51)                     |
| 17 | Biotinyl- $\beta$ Ala-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 52)                         |
| 18 | Biotinyl- $\beta$ Ala-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 53)                             |
| 19 | Biotinyl- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 54)                                 |
| 20 | Biotinyl- $\beta$ Ala-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID No. 55)                                     |

**The paragraph starting at page 29, line 7 has been amended as follows:**

The sequence was assembled in a similar fashion as described for peptide 37, except that Fmoc-Lys(Boc)-Resin (0.5 mmol/g loading; ABI 401425) was used. The H- $\beta$ Ala-Arg(Pmc)-Gln(Trt)-Ile-Lys(Boc)-Ile-Trp-Phe-Gln(Trt)-Asn(Trt)-Arg(Pmc)-Arg(Pmc) -Met-Lys(Boc)-Trp-Lys(Boc)-Lys(Boc)-Resin (SEQ ID No. 19) (300 mg, *ca.* 0.055 mmol) was reacted with 5-carboxyfluorescein (103 mg, 0.27 mmol; Sigma C 0537), PyBOP (142 mg, 0.27 mmol), HOBt (37 mg, 0.27 mmol), and DIEA (71 mL, 0.41  $\mu$ mol) in DMF (5mL) under N<sub>2</sub> and in the dark during 18 h. It was then washed (DMF, CH<sub>2</sub>Cl<sub>2</sub>, and Et<sub>2</sub>O) and dried *in vacuo*. After treatment during 2 h with cleavage / deprotection mixture (12 mL) in the dark and work-up as above, crude peptide was obtained (183 mg). An aliquot (90 mg) was purified by preparative RP-HPLC to afford pure peptide after lyophilisation (38 mg). Anal. RP-HPLC: *t*<sub>R</sub> = 15.7 min, purity > 99 % at

$\lambda = 214 \text{ nm}$  (22.5 – 32.5 % gradient). DE MALDI-TOF MS:  $[M + H]^+ = 2677$ ,  $[2 M + H]^{2+} = 5359$  ( $C_{128}H_{183}N_{35}O_{27}S = 2676.11$ ).

**The paragraph starting at page 32, line 2 has been amended as follows:**

**2.1** In accordance with the methods described in sections 1.1 and 1.2 above, the following peptides were prepared;

RRMKWKK, (SEQ ID No. 2)

NRRMKWKK, (SEQ ID No. 6)

QNRMKWKK, (SEQ ID No. 7)

KRMKWKK, (SEQ ID No. 9)

RKMKWKK, (SEQ ID No. 10)

RREKWKK, (SEQ ID No. 11)

RRQKWKK, (SEQ ID No. 12)

RROKWKK, (SEQ ID No. 4)

RRMKQKK, (SEQ ID No. 13)

RRMKWFK, (SEQ ID No. 14)

RORKWKK, (SEQ ID No. 15)

RRMWKKK, (SEQ ID No. 16)

RROWKKK, (SEQ ID No. 5)

RRMKKWK, (SEQ ID No. 17)

RROKKWK, (SEQ ID No. 18)

KKWKORR (SEQ ID No. 36).

Each of these peptides were used in the peptide internalisation assay described in section 1.3 above and was found to be internalised into cells.

**Table 3, starting at page 33, line 9 has been amended as follows:**

TABLE 3

| N <sup>o</sup> | <i><u>Peptide</u></i>  |
|----------------|--|
| 1              | Biotinyl- $\beta$ Ala-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>( <u>SEQ ID. No. 19</u> ) |
| 21             | Biotinyl- $\beta$ Ala-Ala-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub>                              |

|    |   |
|----|---|
|    | (SEQ ID. No. 20)  |
| 22 | Biotinyl-βAla-Arg-Ala-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 21) |
| 23 | Biotinyl-βAla-Arg-Gln-Ala-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 22) |
| 24 | Biotinyl-βAla-Arg-Gln-Ile-Ala-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 23) |
| 25 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ala-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 24) |
| 26 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Ala-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 25) |
| 27 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Ala-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 26) |
| 28 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Ala-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 27) |
| 29 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 28) |
| 30 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Ala-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 29) |
| 31 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Ala-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 30) |
| 32 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Ala-Lys-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 31) |
| 33 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Ala-Trp-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 32) |
| 34 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Ala-Lys-Lys-NH <sub>2</sub><br>(SEQ ID. No. 33) |
| 35 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Ala-Lys-NH <sub>2</sub><br>(SEQ ID. No. 34) |
| 36 | Biotinyl-βAla-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Ala-NH <sub>2</sub><br>(SEQ ID. No. 35) |

The Table starting at page 36, line 1 has been amended as follows:

| Modification to Penetratin* | Sequence                          |
|-----------------------------|-----------------------------------|
| Met55 Nle                   | RQIKIWFQNRROKWKK (SEQ ID No. 56)  |
| Met55 Nle (retro)           | KKWKORRNQFWIKIQR (SEQ ID No. 57)  |
| Gln50Pro                    | RQIKIWFPNRRMKWKK (SEQ ID No. 58)  |
| 45,50,55Pro                 | RQPIKIWFNRRMPWKK (SEQ ID No. 59)  |
| Trp48,56Phe                 | RQIKIFFQNRMRMKFKK (SEQ ID No. 60) |

The paragraph starting at page 36, line 12 has been amended as follows:

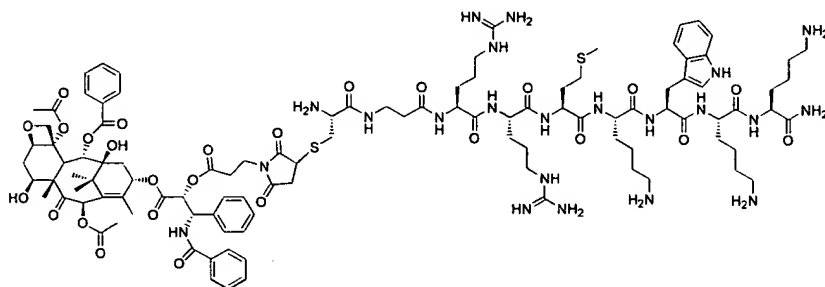
H-Cys-βAla-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61)



Starting from Rink Amide AM resin (0.69 mmol/g, Novabiochem), H-Cys(Trt)- $\beta$ -Ala-Arg(Pmc)-Arg(Pmc)-Met-Lys(Boc)-Trp-Lys(Boc)-Lys(Boc)-resin (SEQ ID No. 61) was assembled. After deprotection (1.5 h), the crude peptide was obtained by precipitation from Et<sub>2</sub>O, centrifugation/decantation, and drying. Aliquots (total 246 mg) were purified by preparative RP-HPLC (6.5 – 16.5 % MeCN gradient) to afford the pure title compound (106.4 mg). Anal. RP-HPLC:  $t_R$  = 15.8 min (6.5 – 16.5 % MeCN gradient, purity > 95 %,  $\lambda$  = 214 nm). DE MALDI-TOF MS:  $[M + H]^+ = 1205.4$  ( $C_{52}H_{92}N_{20}O_9S_2 = 1205.55$ ).

The paragraph starting on page 36, line 22 has been amended as follows:

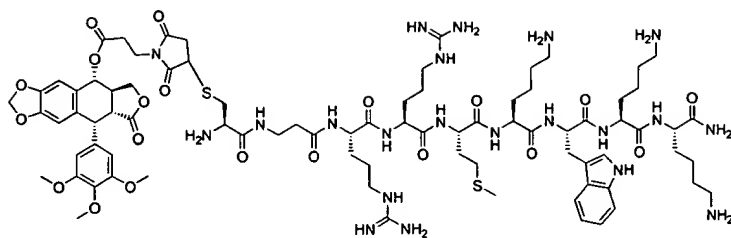
**2'-[Succinimidopropionoyl-(H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]paclitaxel (SEQ ID No. 61)**



To a solution of 2'-(maleimidopropionoyl)paclitaxel (17  $\mu$ mol, 17.4 mg) and H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (15  $\mu$ mol, 18.1 mg) in DMF (1 mL) was added Et<sub>3</sub>N (2.0  $\mu$ L). The mixture was stirred for 1h, filtered and purified by preparative RP-HPLC (10 – 70 % MeCN gradient). The pure title compound (9.4 mg) was obtained as a colourless solid. Anal. RP-HPLC:  $t_R$  = 17.2 min (0 – 60 % MeCN gradient, purity > 97 %). DE MALDI-TOF MS:  $[M + H]^+ = 2211.7$  ( $C_{106}H_{148}N_{22}O_{26}S_2 = 2210.57$ ).

The paragraph starting at page 38, line 4 has been amended as follows:

**4-[Succinimidopropionoyl-(H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]podophyllotoxin (SEQ ID No. 61)**



To a solution of 4-(maleimidopropionyl)podophyllotoxin (17.7  $\mu\text{mol}$ , 10 mg) and H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (25  $\mu\text{mol}$ , 30.4 mg) in DMF (1.5 mL) was added Et<sub>3</sub>N (3.5  $\mu\text{L}$ ). The mixture was stirred for 40 min, filtered and purified by preparative RP-HPLC (0 – 60 % MeCN gradient). The pure title compound was obtained as a colourless solid (17.8 mg, 57 %). Anal. RP-HPLC:  $t_R$  = 14.8 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1772.3$  ( $C_{81}H_{119}N_{21}O_{20}S_2 = 1771.07$ ).

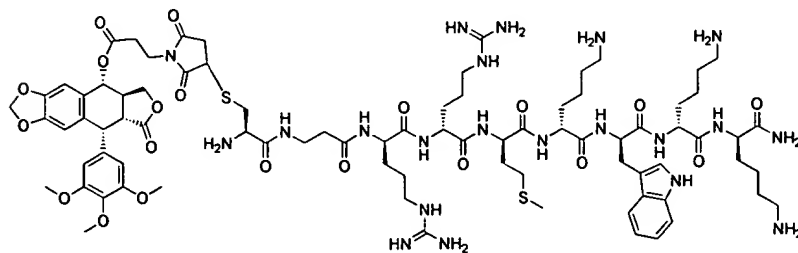
**The paragraph starting at page 38, line 18 has been amended as follows:**

**H-Cys- $\beta$ Ala-D-Arg-D-Arg-D-Met-D-Lys-D-Trp-D-Lys-D-Lys-NH<sub>2</sub> (SEQ ID No. 61)**

Starting from Rink Amide AM resin (0.69 mmol/g, Novabiochem), H-Cys(Trt)- $\beta$ Ala-D-Arg(Pmc)-D-Arg(Pmc)-D-Met-D-Lys(Boc)-D-Trp-D-Lys(Boc)-D-Lys(Boc)-resin (SEQ ID No. 61) was assembled. After deprotection (1.5 h), the crude peptide was obtained by precipitation from Et<sub>2</sub>O, centrifugation/decantation, and drying. Aliquots (total 237 mg) were purified by preparative RP-HPLC (8 – 18 % MeCN gradient) to afford the pure title compound (66 mg). Anal. RP-HPLC:  $t_R$  = 12.9 min (9 – 19 % MeCN gradient, purity > 99 %,  $\lambda$  = 214 nm). DE MALDI-TOF MS:  $[M + H]^+ = 1207.2$  ( $C_{52}H_{92}N_{20}O_9S_2 = 1205.55$ ).

**The paragraph starting at page 39, line 1 has been amended as follows:**

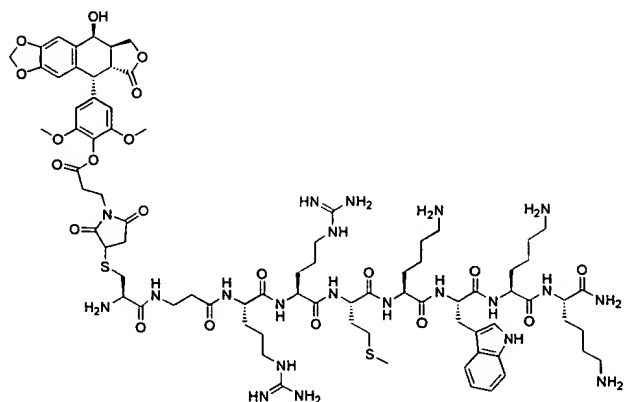
**4-[Succinimidopropionyl-(H-Cys- $\beta$ Ala-D-Arg-D-Arg-D-Met-D-Lys-D-Trp-D-Lys-D-Lys-NH<sub>2</sub>)]podophyllotoxin (SEQ ID No. 61)**



To a solution of 4-(maleimidopropionoyl)podophyllotoxin (18.9  $\mu\text{mol}$ , 10.7 mg) and H-Cys- $\beta$ Ala-D-Arg-D-Arg-D-Met-D-Lys-D-Trp-D-Lys-D-Lys-NH<sub>2</sub> (SEQ ID No. 61) (28  $\mu\text{mol}$ , 33.8 mg) in DMF (1.5 mL) was added Et<sub>3</sub>N (1.5  $\mu\text{L}$ ). The mixture was stirred for 40 min, filtered and purified by preparative RP-HPLC (0 – 60 % MeCN gradient). The pure title compound was obtained as a colourless solid (6.9 mg, 21 %). Anal. RP-HPLC:  $t_R$  = 14.8 min (0 – 60 % MeCN gradient, purity > 98%). DE MALDI-TOF MS:  $[M + H]^+ = 1771.5$  ( $\text{C}_{81}\text{H}_{119}\text{N}_{21}\text{O}_{20}\text{S}_2 = 1771.07$ ).

The paragraph starting at page 40, line 9 has been amended as follows:

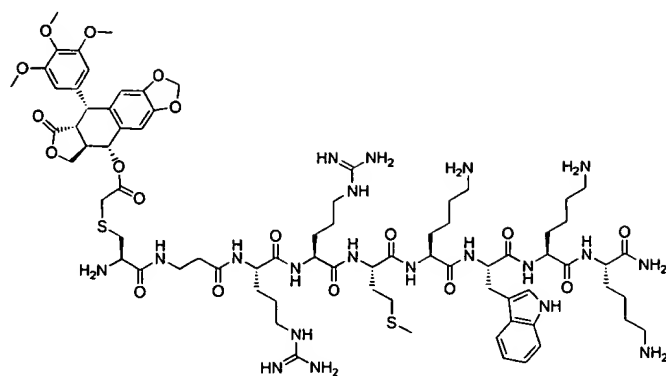
4'-[Succinimidopropionoyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]epipodophyllotoxin (SEQ ID No. 61)



To a solution of 4'-(maleimidopropionoyl)epipodophyllotoxin (14  $\mu\text{mol}$ , 7.9 mg) and H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (26  $\mu\text{mol}$ , 31.5 mg) in DMF (1 mL) was added Et<sub>3</sub>N (1.9  $\mu\text{L}$ ). After stirring for 40 min, the mixture was purified by preparative RP-HPLC (0 – 60 % gradient) to afford the pure title compound as a colourless solid (15.8 mg, 63 %). Anal. RP-HPLC:  $t_R$  = 13.3 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1757.2$  ( $\text{C}_{80}\text{H}_{117}\text{N}_{21}\text{O}_{20}\text{S}_2 = 1757.05$ ).

The paragraph starting at page 41, line 14 has been amended as follows:

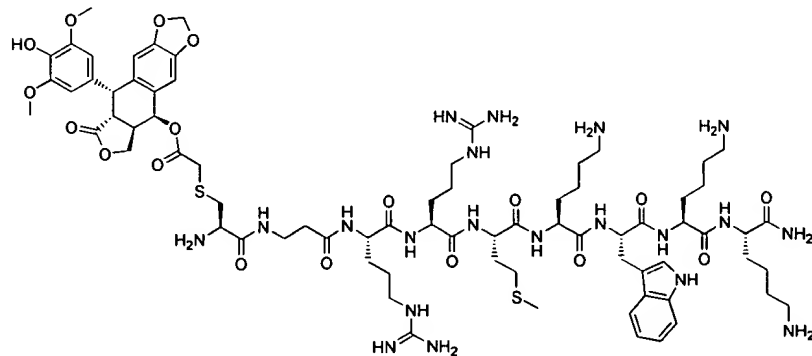
4-[Acetyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]podophyllotoxin (SEQ ID No. 61)



A solution of 4-(iodoacetyl)podophyllotoxin (17  $\mu\text{mol}$ , 10 mg) and H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (23  $\mu\text{mol}$ , 28.6 mg) in DMF (1 mL) was added Et<sub>3</sub>N (2.4  $\mu\text{L}$ , 17  $\mu\text{mol}$ ). After stirring for 1 h MeCN (0.5 mL) was added and the mixture was purified by preparative RP-HPLC (0 – 60 % MeCN gradient) to afford the pure title compound as a colourless solid (29.4 mg, 100 %). Anal. RP-HPLC:  $t_R$  = 14.1 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1661.0$  ( $C_{76}H_{114}N_{20}O_{18}S_2 = 1659.97$ ).

The paragraph starting at page 42, line 21 has been amended as follows:

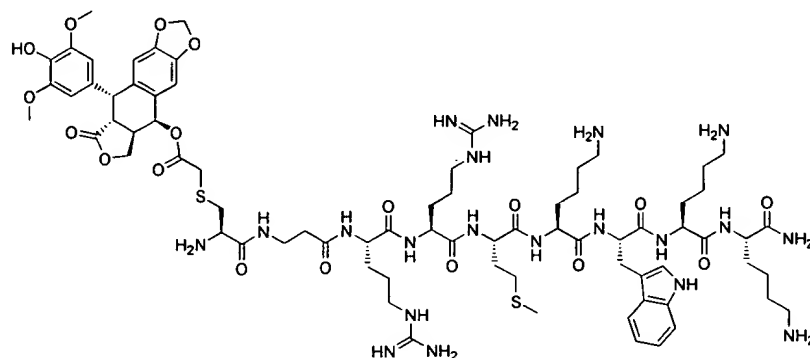
**4'-Demethyl-4-[acetyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]epipodophyllotoxin** (SEQ ID No. 61)



To a solution of 4'-demethyl-4-(iodoacetyl)epipodophyllotoxin (17.6  $\mu\text{mol}$ , 10 mg) and H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (14.9  $\mu\text{mol}$ , 18 mg) in DMF (1 mL) was added Et<sub>3</sub>N (2.1  $\mu\text{L}$ , 15  $\mu\text{mol}$ ). After stirring for 1 h the reaction mixture was purified by preparative RP-HPLC (0 - 60% MeCN gradient) to afford the pure title compound as a colourless solid (11.2 mg, 46 %). Anal. RP-HPLC:  $t_R$  = 12.8 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1647.2$  ( $C_{75}H_{112}N_{20}O_{18}S_2 = 1645.95$ ).

The paragraph starting at page 44, line 17 has been amended as follows:

**4'-Demethyl-4-[acetyl-(H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]epipodophyllotoxin** (SEQ ID No. 61)



To a solution of 4'-demethyl-4-(iodoacetyl)epipodophyllotoxin (17.6  $\mu$ mol, 10 mg) and H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (14.9  $\mu$ mol, 18 mg) in DMF (1 mL) was added Et<sub>3</sub>N (2.1  $\mu$ L, 15  $\mu$ mol). After stirring for 1 h the reaction mixture was purified by preparative RP-HPLC (0 - 60% MeCN gradient) to afford the pure title compound as a colourless solid (11.2 mg, 46 %). Anal. RP-HPLC:  $t_R$  = 12.8 min (0 - 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+$  = 1647.2 ( $C_{75}H_{112}N_{20}O_{18}S_2$  = 1645.95).

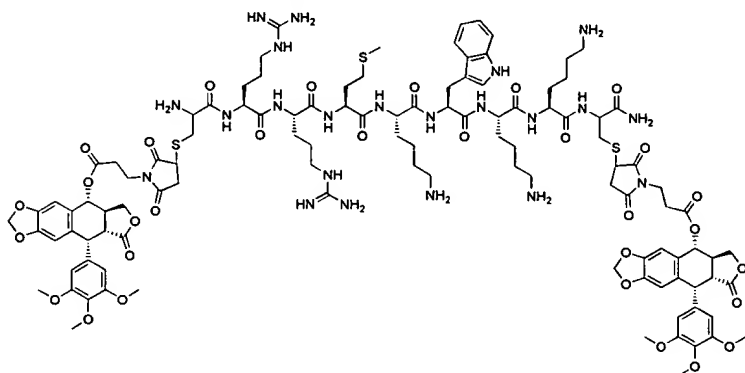
The paragraph starting at page 45, line 12 has been amended as follows:

**H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub>** (SEQ ID No. 62)

Starting from Rink Amide AM resin (0.69 mmol/g, Novabiochem), H-Cys(Trt)-Arg(Pmc)-Arg(Pmc)-Met-Lys(Boc)-Trp-Lys(Boc)-Lys(Boc)-Cys(Trt)-resin (SEQ ID No. 62) was assembled. After deprotection (1.5 h), the crude peptide was obtained by precipitation from Et<sub>2</sub>O, centrifugation/decantation, and drying. Aliquots (total 258 mg) were purified by preparative RP-HPLC (9 - 19 % MeCN gradient) to afford the pure title compound (132.4 mg). Anal. RP-HPLC:  $t_R$  = 20.3 min (8 - 18 % MeCN gradient, purity > 99 %,  $\lambda$  = 214 nm). DE MALDI-TOF MS:  $[M + H]^+$  = 1238.6 ( $C_{52}H_{92}N_{20}O_9S_3$  = 1237.63).

The paragraph starting at page 45, line 22 has been amended as follows:

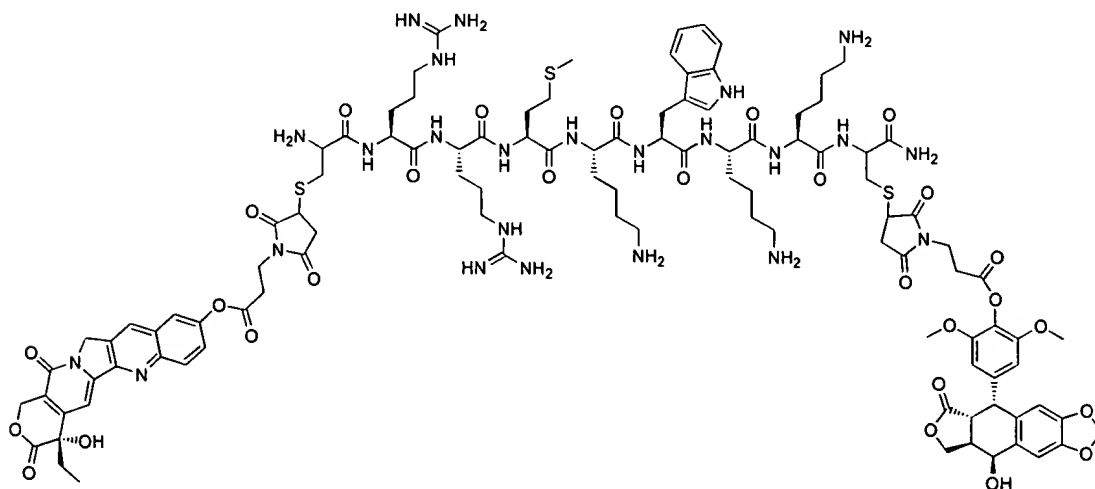
**Bis-[4-(succinimidopropionoyl)podophyllotoxin]-(H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub>) (SEQ ID No. 62)**



To a solution of 4-(maleimidopropionoyl)podophyllotoxin (19  $\mu$ mol, 11 mg) and H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub> (SEQ ID No. 62) (12  $\mu$ mol, 15 mg), in DMF (1 mL) was added Et<sub>3</sub>N (2.8  $\mu$ L). After stirring for 1 h the mixture was purified by preparative RP-HPLC (10 – 70 % MeCN gradient) to afford the pure title compound as a colourless solid (9.0 mg, 32 %). Anal. RP-HPLC:  $t_R$  = 17.4 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 2369.7$  ( $C_{110}H_{146}N_{22}O_{31}S_3 = 2368.66$ ).

The paragraph starting at page 46, line 13 has been amended as follows:

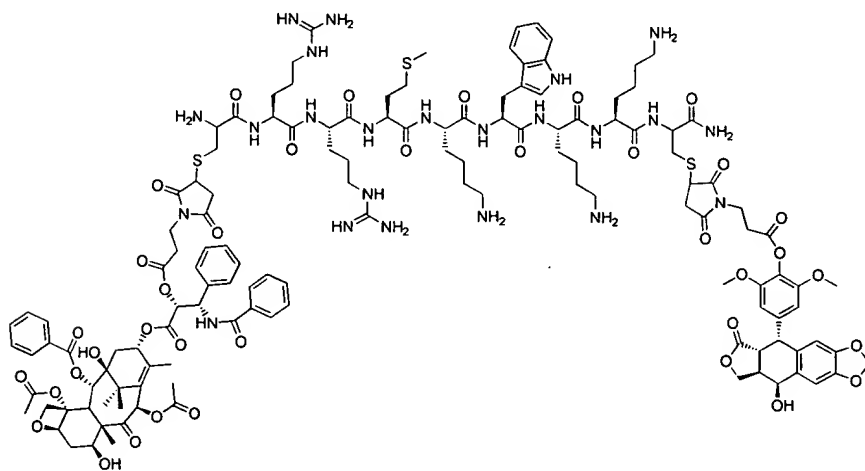
**4'-(Succinimidopropionoyl)epipodophyllotoxin-(H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub>)-10-O-(succinimidopropionoyl)camptothecin (SEQ ID No. 62)**



To a solution of 10-*O*-(maleimidopropionoyl)camptothecin (0.005 mmol, 2.6 mg), 4'-(maleimidopropionoyl) epipodophyllotoxin (5.6  $\mu$ mol, 3.1 mg), and H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub> (SEQ ID No. 62) (11  $\mu$ mol, 13 mg), in DMF (1.5 mL) was added Et<sub>3</sub>N (1.5  $\mu$ L). After stirring for 1.5 h the mixture was purified by preparative RP-HPLC (10 – 70 % MeCN gradient ) to afford the pure title compound as a colourless solid (1.9 mg). Anal. RP-HPLC:  $t_R$  = 14.8 min (0 – 60 % MeCN gradient, purity > 96 %). DE MALDI-TOF MS:  $[M + H]^+$  = 2304.6 (C<sub>107</sub>H<sub>138</sub>N<sub>24</sub>O<sub>28</sub>S<sub>3</sub> = 2304.58).

The paragraph starting at page 47, line 11 has been amended as follows:

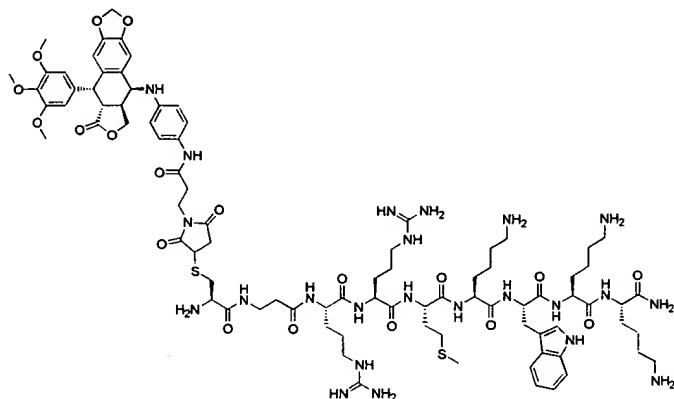
**4'-(Succinimidopropionoyl)epipodophyllotoxin-(H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub>)-2'-(succinimidopropionoyl)paclitaxel (SEQ ID No. 62)**



To a solution of 4'-[succinimidopropionoyl-(H-Cys-Arg-Arg-Met-Lys-Trp-Lys-Lys-Cys-NH<sub>2</sub>)]epipodo-phyllotoxin (SEQ ID No. 62) (2  $\mu$ mol, 3.5 mg), 2'-(maleimidopropionoyl)paclitaxel (2  $\mu$ mol, 2 mg) in DMF (1 mL) was added Et<sub>3</sub>N (0.3  $\mu$ L). After stirring for 1.5 h the reaction mixture was purified by preparative RP-HPLC (10 – 70 % MeCN gradient) to afford the pure title compound as a colourless solid (1.5 mg). Anal. RP-HPLC:  $t_R$  = 17.8 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M+H]^+$  = 2794.5 (C<sub>134</sub>H<sub>173</sub>N<sub>23</sub>O<sub>37</sub>S<sub>3</sub> = 2794.14).

The paragraph starting at page 48, line 1 has been amended as follows:

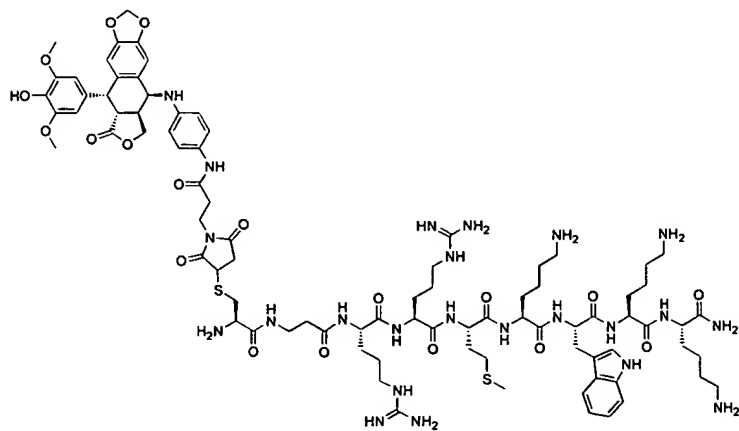
**4'-Methoxy-4-[4''-aminoanilino-(succinimidopropionoyl)]-(H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]epipodophyllotoxin (SEQ ID No. 61)**



To a solution of 4'-methoxy-[4''-aminoanilino-(maleimidopropionoyl)] epipodophyllotoxin (7  $\mu$ mol, 4.6 mg) and H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (14  $\mu$ mol, 16.3 mg) in DMF (1 mL) was added Et<sub>3</sub>N (1  $\mu$ L). After stirring for 1 h, the mixture was purified by preparative RP-HPLC (0 – 60 % MeCN gradient) to afford the pure title compound as a colourless solid (6.4 mg, 49 %). Anal. RP-HPLC:  $t_R$  = 15.2 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1861.6$  ( $C_{87}H_{125}N_{23}O_{19}S_2 = 1861.20$ ).

The paragraph starting at page 49, line 11 has been amended as follows:

**4'-Demethyl-4-[4''-aminoanilino-(succinimidopropionoyl)]-(H-Cys- $\beta$ -Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]epipodophyllotoxin (SEQ ID No. 61)**





To a solution of 4'-demethyl-[4''-aminoanilino-(maleimidopropionyl)]-epipodophyllotoxin (8.3  $\mu$ mol, 5.3 mg) and H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub> (SEQ ID No. 61) (13  $\mu$ mol, 15.6 mg) in DMF (1.5 mL) was added Et<sub>3</sub>N (2  $\mu$ L). After stirring for 1 h, the mixture was purified by preparative RP-HPLC (0 – 60 % MeCN gradient) to afford the pure title compound as a colourless solid (14.9 mg, 97 %). Anal. RP-HPLC:  $t_R$  = 13.7 min (0 – 60 % MeCN gradient, purity > 98 %). DE MALDI-TOF MS:  $[M + H]^+ = 1847.1$  ( $C_{86}H_{123}N_{23}O_{19}S_2 = 1847.17$ ).

**Table 8 starting at page 51, line 1 has been amended as follows:**

Table 8

| Test Compound   | Activity<br>observed <sup>a</sup> |
|---|-----------------------------------|
| Etoposide   | IC                                |
| Podophyllotoxin   | -                                 |
| 4'-Demethylepipodophyllotoxin   | IC                                |
| 4'-Demethyl-4-(4''-aminoanilino)epipodophyllotoxin  | I                                 |
| H- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub> (SEQ ID No. 54)  | -                                 |
| 4-[Succinimidopropionyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub> )]podophyllotoxin (SEQ ID No. 61)                                   | -                                 |
| 4'-[Succinimidopropionyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub> )]epipodophyllotoxin (SEQ ID No. 61)                               | IC                                |
| 4'-Demethyl-4-[acetyl-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub> )]epipodophyllotoxin (SEQ ID No. 61)                                  | IC                                |
| 4'-Demethyl-4-[4''-aminoanilino-(succinimidopropionyl)-(H-Cys- $\beta$ Ala-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH <sub>2</sub> )]epipodophyllotoxin (SEQ ID No. 61) | I                                 |

<sup>b)</sup> I denotes inhibition of relaxation of supercoiled plasmid by topoisomerase II. C denotes accumulation of topoisomerase II reaction intermediate.

**The paragraph starting at page 51, line 9 has been amended as follows:**

*Comparison of full length and truncated penetratin as a vector for a drug moiety*

In order to compare the cytotoxic biological effect on cancer cells (cell lines in *Table 9*) of the drug moieties applied using full length and truncated penetratin carrier moieties, appropriate podophyllotoxin-conjugates (podophyllotoxin-(16mer vector), 4-[succinimidopropionoyl-(H-Cys-Arg-Gln-Ile-Lys-Ile-Trp-Phe-Gln-Asn-Arg-Arg-Met-Lys-Trp-Lys-Lys-Gly-Cys-Gly-NH<sub>2</sub>)] podophyllotoxin (SEQ ID No. 63); podophyllotoxin-7mer vector, 4-[Succinimidopropionoyl-(H-Cys-βAla-Arg-Arg-Met-Lys-Trp-Lys-Lys-NH<sub>2</sub>)]-podophyllotoxin) (SEQ ID No. 61), were exposed to cells at appropriate concentrations.